

Effects Of Location
Of Weather Station
In Teaching Weather
Element In Senior
Secondary Schools In
Kaduna North

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ABSTRACT

This study seeks to determine the effects of location of weather station in teaching weather element in senior secondary schools in Kaduna north. The study was restricted to a particular senior secondary school in Kaduna north due to the experimental nature of the research work. three research questions were asked and two hypotheses were formulated and tested by experimentation with a total number of forty (40) (male and female) students offering geography in senior secondary school three (SSSIII). The research was experimental in nature therefore the pre-test, post-test control and experimental group design was employed for the study. Forty (40) students were randomly selected and divided into groups. The experimental groups were taught weather element using a weather station as an instructional aid and the control were taught in the classroom without a weather station. Twenty (20) multiple choice questions for both pre-test and post-test was used to collect data for the study from students while an interview was scheduled to obtain data from teachers. The data for the research were collected and analyzed statistically at 0.05 level of significant using t-test statistics, the data analyzed were used to answer the research questions and hypotheses formulated for the study. The performance of students in experimental group was in upward projection due to the use of weather station as instructional material compare to students taught in the classroom (control group). Government should ensure that weather stations are located in all secondary schools; this will improve the understanding of the dynamic nature of weather and give better understanding of the environment.

Keywords: Teaching method, weather station, weather elements, instructional aid, academic performance, gender

1. INTRODUCTION

The importance of geography in secondary schools curriculum cannot be over emphasized as one of the required subject in the curriculum of secondary schools in Nigeria (national policy on education). The teaching of geography is been done by secondary school teachers using different methodologies all of which required the use of instructional materials (Aremu, 2001 in Adeyemi 2008). These methods include discussion, lecture, fieldwork, textbook, problem solving, project, question and answer, dramatization, laboratory, experimental, and discovery as well as the expository method (Seweje, 2000 and Ajayi 2004). Modern teaching methods has been used in geography teaching which was set at the curriculum of geography such as; student-centered education, learning by doing and applying, constructivist education, multiple-intelligence theory-based training, active learning, problem solving based training, the use of information and communication technologies. The successful utilization of these teaching methods depends upon the nature of the teaching force of geography. These methods can improve learning when properly use with appropriate

instructional materials such as visuals (charts, maps, graphs, physical models), audio (radio) and audio-visuals (computer, television, animated models), realia, that is real specimen as it's the best sited during field work.

Therefore, the researcher intend to explore into the almost neglected aspect of teaching in geography in secondary schools so as to be able to reap the immense advantages having a weather station in a secondary school as instructional material for effective teaching of weather elements in geography and importantly to redress the falling standard of students' performance in geography as well as producing geography graduates that are sound enough to merge their classroom knowledge with a result-oriented field experience in a weather station. The place of geography laboratory and weather stations in the teaching and learning process have been highlighted by Makanjuola (2005), such infrastructural facilities have not been effectively used in recent times in the teaching of geography in schools. preliminary field investigation by this study revealed that no weather station existed in most of the schools sampled. The few geography gardens seen in the schools visited were in various stages of decay.

A weather station is a facility, either on land or sea, with instruments and equipment's for measuring atmospheric conditions to provide information for weather forecast. The measurements taken include temperature, barometric pressure, humidity, wind speed, wind direction and precipitation amount. Wind measurements are taken with as few as other obstructions as possible, while temperature and humidity measurements are kept free from direct solar radiation, or insolation. Manual observations are taken at least once daily, while automated measurements are taken at least once an hour. Typical weather stations have the following instruments: thermometer for measuring air and sea temperature, barometer for measuring atmospheric pressure, hygrometer for measuring humidity, anemometer for measuring wind speed, rain gauge for measuring liquid precipitation over a set period of time. Except for those instruments requiring direct exposure to the elements (anemometer, rain gauge), the instrument should be sheltered in a vented box, usually a Stevenson screen, to keep direct sunlight off the thermometer and wind off the hygrometer. The instrumentation may be specialized to allow for periodic recording otherwise significant manual labour is required for record keeping. The location of a weather station in a school play a significant role in teaching and learning of geography as an instructional material, its gives easy access to the station and made teaching and understanding of weather and climate. Field experience in a weather station as pointed by Damar, (2004) gives students' valuable practical experience, sustain their interest in the subject and makes learning more permanent.

An ideal teaching of geography incorporates proper method, instructional materials, and teacher's quality and learning environment, when all these are in place, the quality of instruction will improve and students' performance will significantly be better, this is to ensure adequate acquisition of knowledge and geographic skills by students, provide firsthand information and eliminate abstract ideas and fact in geography. In recent years, the number of candidate passing geography at credit level in West Africa Examination Council

(WAEC), General Certificate Examination(GCE) and similar ordinary level examinations has dwindled. Consequently, the number of candidates qualified and eventually given admission to study geography at tertiary institutions in Nigeria is worrisome. If this situation is not addressed and reversed, it may spell doom for the subject in no distant future. WAEC chief examiner report identified poor preparation for the examination, poor coverage of the syllabus, unavailability of appropriate equipment for practical surveys in the school setting, among others as the causes of students poor performance (WAEC: 2007, pp. 72-78). Therefore, the problems are;

- What instructional material will enhance students understanding of the concept of weather element and improve their performances in external and internal examinations?
- How will the students be taught weather and climate so as to develop their interest and improve their performance?

The researchers intend to investigate the effect of the location of weather station on the teaching of weather element in Kaduna north local government area.

The study specifically pursues the following objectives. To:

- Determine the instructional material that will enhance students understanding of weather element
- Determine the effect of location of weather station on students' performance in element of weather in geography
- Compare students' performance on the basis of gender.

The study was guided by the following research questions.

- What instructional materials are appropriate for the teaching and learning of weather element in geography?
- What will be performance mean score of the two groups (experimental and control groups of students)?
- What is the difference in the mean scores of experimental group due to gender?

The following null hypotheses were formulated for this study:

- There is no significant difference in students' performance on weather element between those taught in a weather station and those taught in the classroom.
- There is no significant difference in the mean score performance between male and female students taught weather element in a weather station.

2. METHODOLOGY

This study is quasi- experimental in nature, utilizing the pre-test post-test control group design There are two groups in this study drawn from the same population of SSS III geography students in kaduna north. The

assignment of the students into two groups was done through randomization. One of the groups was randomly designated experimental group or group 1 while the other group was control group or group 2. In this study, the experimental group was exposed to teaching weather element in a weather station while the control group was taught in the classroom. The aim of the design is to compare the post test scores of the two groups in an achievement test on the element of weather in geography. The population of the study is the entire SSS III students offering geography and geography teachers in all senior secondary schools in kaduna north local government area was the target group for the study. Forty (40) SSS III geography student drawn from one senior secondary school in kaduna north and six (6) geography teachers selected from three (3) senior secondary schools in the study area were used as sample for the study.

The researcher utilized purposive sampling technique to choose the sampled schools. One senior secondary school for the experimental work and three (3) other schools were selected from the population of schools for teacher's interview. Forty (SSSIII) students were randomly selected by the use of table random numbers. This was done by developing a sampling frame of list of students in SSS III in the selected school. The students were numbered in the sampling frame serially from 001 to the last number. The researcher entered the table of random numbers at a random starting point by closing both eyes using a pencil to mark any point on the table. The researcher read the table from the starting point, downward and recorded the numbers present in the sampling frame until 40 students were selected. The students whose numbers were selected from a random numbers constituted the sample that was used for the study. The forty students that were randomly selected from sampled school were again randomly divided into two groups. Each group contained 20 students. This division was done by making 40 students to stand in line and serial numbers 1-40 given to them. Those with even numbers were assigned by the researcher to experimental group while those with odd number were assigned to control group.

Geography achievement test (GAT) was constructed by the researcher in the area of weather element in geography. The GAT consist of 20 multiple choice items. The aim of pretest is to establish a pre-experimental ability of the sample student. The treatment was administered to the two groups using research assistants. Teacher quality variable was ensured by using geography teachers in the sample school who served as research assistants to each group. The research assistants were given detailed instructions with articulated lesson packages on element of weather in geography. After the treatment, the students were post tested using the same GAT but items were rearranged. In addition, an interview schedule was used to obtain data from geography teachers within the three sample schools on instructional materials that will enhance the understanding of weather elements.

The test items were subjected to scrutiny by two experts from department of geography education and the other from test and measurement to determine the validity of the instrument. Kuder-Richardson modified formula (KR-21) was used to estimate reliability of test instrument, and (0.86) was obtained as reliability

coefficient. After obtaining due permission from the school management, the experimental group was taken to a weather station for instruction while the control group was handle in the classroom after which the student were ordered to sit for the test. The attention of the students was drawn to the test instructions; the test was administered with the assistance of two geography teachers. The scripts were collected immediately the time allocated to test expired. The students were instructed to leave their scripts on the tables and leave the room. The researcher and research assistants went round and collect the scripts beginning from the first row and subsequent ones. The researcher also conducts an interview to collect data from teacher on the instructional materials that can be used to enhance the understanding of weather element in geography. Simple percentage was used to answer research question one while mean score was used to answer research questions two and three. T-test statistics for independent sample was used to test for hypotheses.

3. RESULTS

Research question one

What instructional materials can be used to enhance students understanding of weather element?

Table 1: Teachers Responses on Instructional Materials that will enhance students understanding of weather element

Responses	frequency (f)	Percentages (%)
Visit to a weather station	4	66.67
Use of charts and diagrams	0	0
Use of models	0	0
Use of improvised weather element in the classroom	2	33.33
Total	6	100

Table 1 shows teachers responses on instructional materials that can be used to enhance students understanding of weather element. The table revealed that, a total of four (4) teachers consisting 66.67% are of the opinion that the best instructional material to enhance student understanding of weather element is to visit a weather station or have the lesson done in a weather station while 2 teachers consisting 33.34% are of the opinion that, for students to understand the concept of weather materials should be improvised by teachers and brought to the classroom to eliminate abstraction of concepts and facts. The teachers reject the idea of using model and charts to teach weather element as it is not appropriate to enhance understanding of weather element.

Research question two

What will be the performance mean score of the two groups (experimental and control groups of students)?

Table 2: Posttest Results for Experimental and Control Group

Sample Group	Number of students (n)	Students' Scores (x)	Mean score (x)	Standard Deviation (Sd)
Experimental	20	332	16.60	3.32
Control	20	198	9.90	3.64

Table 2 shows that, experimental group score a total of 322 with a mean (x) score 16.60 and standard deviation of 3.32 while the control group has a score of 198 with a mean (x) of 9.90 and standard deviation of 3.64 the mean (x) difference between the experimental and control group is 6.70. This indicates that, experimental group performed significantly better than the control group as seen in table 2. This answered research question two.

Research question three

What is the difference in the mean score of the experimental group due to gender?

Table 3: Post Test Results of Male and Female Students Mean Score Performance

Sample Group	Number of students (n)	Students' Scores (x)	Mean score (x)	Standard Deviation (Sd)
Male	10	200	20.00	2.07
Female	10	146	14.60	3.41

Table3 shows the performance of male and female students. The mean (x) score of male 20.0 with a total score of 200 and standard deviation of 2.07 while female mean score is 14.60 with a total score of 146 and a standard deviation of 3.41. The mean difference is 5.40. This indicates that male students performed better than the female students. Therefore, there is a significant difference among students when taught element of weather in weather station due to gender. This answered research question three.

4. TESTING HYPOTHESES

Hypothesis one

There is no significant difference in students' performance on element of weather between those taught in a weather station and those taught in the classroom.

Table 4: Posttest Results for Experimental and Control Group

Sample Group	N	DF	x	x	t-calculated	t-critical	α
Experimental	20	38	332	16.60	3.40	2.02	0.05
Control	20		198	9.90			

The results in table 4; show that, the t-calculated value is greater than the t-critical value (3.40 > 2.02).this means that those in experimental group performed better than the control group. The null hypothesis one

which states that, there is no significant difference between students' performance on weather element between those taught in a weather station and those taught in the classroom is thereby rejected. Therefore, there is a significant difference in student's performance on element of weather between those taught in a weather station and those taught in the classroom.

Hypothesis two

There is no significant difference in the mean score performance between male and female students taught weather element in a weather station.

Table 5: post test results of male and female students mean score performance

Sample group	N	DF	\bar{x}	s_x	t-calculated	t-critical	α
Male	10	18	200	20.00	2.01	1.73	0.05
Female	10		146	14.60			

Table 5 shows that, the t-calculated value is greater than the t-critical value ($2.01 > 1.74$). since the t-calculated value is greater than the t-critical value, the null hypothesis two which states that, there is no significant difference in the mean score between male and female students taught weather element in a weather station is hereby rejected. Therefore, there is a significant difference in the mean score performance between male and female students taught weather element in a weather station.

5. DISCUSSION

The aim of the study is to investigate the effects of location of weather in teaching weather element in senior secondary schools in Kaduna north,. Mean score was used to answer research questions one and two while simple percentage was used to answer research question three. Table 1 show that, 66.67% of teachers are of the view that weather element should be taught in a weather station while 33.33% suggest that instruments should be improvised and brought to classroom to make learning meaningful Research question two revealed that, the performance of experimental group was significantly different with a higher mean score compare to the control group as explained in table 2. Table 3, reveals that there exist gender differences as seen in the mean score of male and female students both exposed to weather station as instructional material in the teaching of weather element.. The null hypothesis generated were statistically analyzed and interpreted at 0.5 level of significance to reject or accept the proposed hypotheses, hence, the interpretations and decisions were taken with 95% confidence.

The hypothesis tested statistically in table 4: show that, there is a significant difference in the mean score of students taught weather element using weather station as instructional materials and those taught in the classroom. The findings are in line with that of Oyeyemi, (1999) in Ema (2011) who stated that instructional

materials of valid geographical features enable the teacher to make a lesson explicit to the learners while teaching physical aspect of geography. He further maintained that it also transmit information, idea and note to students and disseminate information in such a way that will modify students attitudes, habit and practices in a complete manner or task. The use of weather station as instructional aid in teaching weather element helps teachers to make lessons easier and also saves time. This also makes geography an interesting subject to the learners and to the teachers. The use of weather station in teaching weather element improves the performance of students in geography especially those that are taught using it and also serve as a motivation to the study of geography.

Research hypothesis two emphasized on gender differences in performance of students between male and female students all drawn from the experimental group. Male students performed significantly better than the female students as explain in table 5. This signifies that gender plays a vital role in understanding geographic concepts, facts and knowledge.

6. CONCLUSION

The study focused on the effects of location of weather station in teaching weather element in senior secondary schools. The study sought information on teacher's opinion on the instructional material that will enhance students understanding of weather element, determine the effect of location of weather station on students' performance in element of weather in geography, and compare students' performance on the basis of gender. A structured questionnaire for teacher's opinion on the instructional materials required for the teaching of weather element and a performance test for students was used as instruments for data collection. The study revealed that;

Most Geography teachers are the view that weather element should be taught in a weather station though some suggested that, instruments for measuring weather elements should be improvised and brought to classroom to make learning meaningful. Also, students taught in the weather station performed significantly better compare to those taught in the classroom meanwhile, gender differences in performance exist between the mean score of male and female students both exposed to teaching weather elements using weather station as instructional material. The hypotheses tested revealed that, there is a significant difference in the mean score of students taught weather elements using weather station as instructional materials and those taught in the classroom also, a significant difference exist between the performance of male and female students taught weather elements using weather station as instructional material.

7. RECOMMENDATIONS

The following are possible recommendations made from this research work.

1. Government should ensure that weather stations are located in all secondary schools, this will improve the understanding of the dynamic nature of weather and climate and gives better understanding of the environment as weather and climate are involved and also enhance the study of geography.
2. Geography teachers should be encouraged as much as possible to use visual instructional aid such as weather station in teaching and learning situations. This will enhance better understanding of geographic concepts.
3. In schools where weather stations are not located, teachers with the support of the school authority should endeavor to arrange with nearby schools where weather stations are located on other to use it as an instructional aid to foster better understanding.
4. Geography teachers should ensure that geography students are giving task to perform in the weather station such as recording temperature using thermometer, rainfall using rain gauge and other element of weather. This will enable the students to make accurate readings and plot necessary graphs as it affect weather changes.
5. Fieldwork should also be encouraged by schools authority to places such as the air port and universities where there are synoptic weather stations. This will expose the students to advance instrument for weather recordings.
6. Geography teachers should engage themselves in improvising materials needed for geographic instructions, since they exactly know what is required for effective teaching and learning process.
7. The education authorities, concerned individuals and organization, ministries and government of the country should invest in the production of indigenous instructional materials such as instruments of weather element through improvisation to help the education sectors enhance teaching and learning process.

8. REFERENCES

- Adeyemi, T.O. (2008). Effective teaching of geography in secondary schools in ondo state, Nigeria. Ado-Ekiti. *The social sciences* 3(2).
- Ajayi, I.A. (2004). *Social Science Methods*. Ado-Ekiti Green line Publishers. Pp: 58-72
- Damar, D.N. (2004). *The Making of The Geography Teacher*. Jos. Deka Publications.
- Ema, E., & Ajayi.D.T. (2011). *Educational Technology Methods, Materials and Materials* (2nd ed) Jos: University Press Limited.
- Makanjuola, S.A. (2005). *Geography Laboratory and Observation Center*. *Online Research Journal.com* 117
- Seweje, R. O. (2000). The Challenges of Science Teaching in Nigeria Today. *Journal of Educational Foundations and Management*. 1: 216-217.